Optimal Questions

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OPTIMAL QUESTIONS*

In this paper we present an analysis of question formation couched in an optimality-theoretic framework. Particular attention will be paid to the typology of multiple questions. It will be argued that this typology can be derived from the reranking of two constraints on question formation and a condition disfavoring movement. The discussion is mainly based on English, Bulgarian, Czech and Chinese/Japanese, which instantiate four basic patterns of multiple question formation. Some specific problems posed by French and Irish are also addressed.

1. Introduction

Languages form multiple questions in different ways. In English and Dutch, the verb and the highest WH-element are fronted, while the other WHs remain *in situ* (cf. (1a)). In Bulgarian and Romanian, the verb is fronted and all WHs are moved to the specifier of the highest functional projection (cf. (1b)). In Czech and Polish, the verb remains *in situ*, whereas all WHs are adjoined to the verbal projection (cf. (1c)). Finally, in Chinese and Japanese, nothing moves (cf. (1d)). In this paper, we will consider how to account for this typological pattern.

(1)a. [What$_i$ has$_j$ [John t$_j$ given t$_i$ to whom]] (English)

b. [[Koj$_i$ kogo$_j$] vižda$_k$ [t$_i$ t$_k$ t$_j$]] (Bulgarian)
who whom sees

c. [Kdo$_i$ [koho$_j$ [t$_i$ viděl t$_j$]]] (Czech)
who whom saw

d. [Shei mai-le shenme] (Chinese)
who bought what

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We will argue that in an optimality-theoretic framework (cf. Prince and Smolensky 1993) this cross-linguistic variation can be made to follow from the reranking of two constraints on question formation and a general condition disfavoring (overt) movement.[1] In the next section we will introduce the constraints that determine how questions are formed. First, however, we will briefly discuss the notion of constraint interaction.

In traditional grammars facts are derived by a conspiracy of principles, but the principles themselves do not compete. No principle is violated in order to avoid violating another principle. In fact, no principles are violated at all in a grammatical sentence.

Optimality theory proposes a radical breach with this traditional view. The theory consists of two components. The first is a device, called GEN(erator), which determines how elements can be combined into a structure. The demands that GEN imposes on structures cannot be violated.[2] The second component is an evaluation metric that chooses from the output of GEN the structure that best satisfies a set of universal constraints. These constraints are all violable, and their impact in a specific language follows from their ranking and collective evaluation.

Evaluation proceeds as follows. The structures to be compared (which make up the so-called candidate set) are first evaluated with respect to the highest-ranked constraint. In case two or more candidates receive an equal score, they are judged by the next highest constraint, and so on. The candidate that survives this procedure is optimal and thereby grammatical; the other ones are all ungrammatical. A consequence of this view of constraint interaction is that no constraint is necessarily surface true. A lower-ranked constraint can be violated in an optimal structure when this structure scores better on a higher-ranked constraint than its competitors. Even the highest ranked constraint can be violated, namely in case there is no potential output that does not violate it.

Optimality theory seeks to explain language variation as a consequence of different rankings of constraints. Each possible ranking must determine the grammar of a natural language and each grammar of a natural language

[1] An optimality-theoretic approach to different aspects of the syntax of questions is also proposed in Billings and Rudin (1996), Legendre et al. (1995) and Müller (1997). These papers share some assumptions with the present paper, but the analyses presented in them are different with respect to some theoretical and empirical issues. It is beyond the scope of this paper to compare the various proposals.

[2] Demands that determine well-formedness of syntactic structure include X-bar theory, but also restrictions like Subjacency, which define well-formed chains. That such demands are part of GEN is implied by the fact that they universally rule out certain structures for which there are no more optimal competitors that would block them. Examples are structures involving a doubly-headed XP or extraction out of adjuncts.

must be determined by some ranking. This means that there is an interesting way of testing the validity of optimality theory. Reranking of well-motivated constraints that handle data in a specific language should result in the (partial) grammar of another language. If this indeed turns out to be the case, it presents a strong argument for constraint interaction.

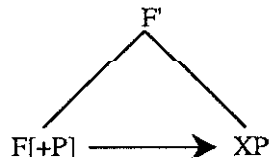
2. The Constraints

In this section we will discuss the constraints that are relevant to the formation of questions.

2.1. *Q-Marking*

It is a familiar idea that heads may mark properties of their complements. For instance, a verb may assign a thematic role and possibly case to its complement. Functional heads, too, can be viewed as elements that mark their complement, namely for such properties as tense, modality, aspect, and, as we will argue, questionhood. The general scheme for marking by a functional head is the one in (2).

(2)



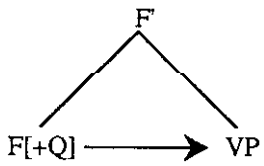
We assume that functional structure is only generated when such marking is required by the grammar. This ties in with theories like those of Ackema et al. (1993) and Grimshaw (1997), who argue that clauses do not have a fixed functional skeleton. Rather, functional architecture varies across languages and across different constructions within a language. In such theories it is impossible to assign fixed labels like AgrS and AgrO to functional projections. Hence, we will simply refer to functional projections as FPs.

In the theories just mentioned, an FP can only be present if its head position is filled. Grimshaw (1997) takes this to be a violable constraint. However, we assume that it is a part of X-bar theory, and that X-bar theory is contained in GEN (see note 2). Hence, the condition that head positions must be filled is absolute (see Ackema et al. 1993 and Bakovic 1995). The head of a functional projection can either be filled by a functional element taken from the lexicon, or by a moved lexical head.

The consequence is that if an XP must be marked for some property, as in (2), and if a functional head cannot be inserted, head movement out of XP is required (see also Koeneman 1996).

One constraint relevant to the formation of questions requires a specific type of marking, namely the marking of the proposition as a question (Q-marking). Since the proposition is expressed by VP (under the VP-internal subject hypothesis), it is VP that must be Q-marked:

(3)



In English, questions are obligatorily marked as such. A straightforward instance of Q-marking is found in embedded yes/no questions. Here a base-generated functional head bearing the Q-feature takes the VP to be marked as its complement:

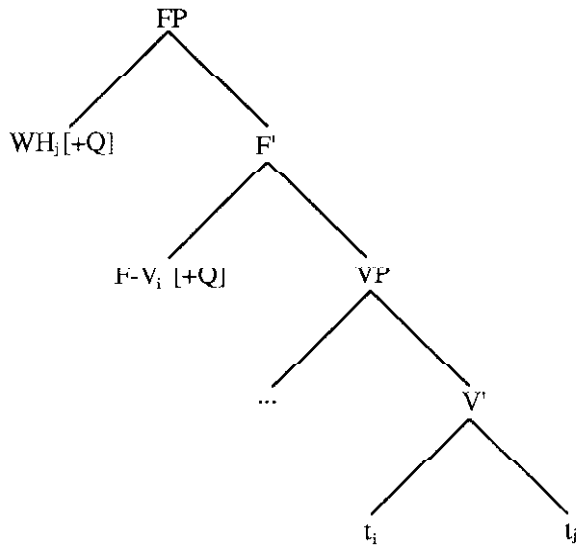
(4) John wonders $[_{FP}$ if $[_{VP}$ you have seen the soccer match]]
+Q

In matrix WH-questions like (5), it is not immediately obvious that Q-marking involves a head-complement configuration since the Q-feature seems to be present on the WH-expression, not on the verb.

(5) $[_{FP}$ What$_j$ have$_i$ $[_{VP}$ you t_i seen t_j]]

This is not problematic, however. By the general mechanism of spec-head agreement, the WH-specifier will transfer its Q-feature to the verb, after which this head is capable of Q-marking its complement. Rather than being problematic, (5) illustrates an effect of functional marking mentioned above, namely that it may trigger head movement. In the absence of a complementizer in this root environment, the verb must move to the functional head dominating VP. If it did not, the functional projection that hosts the Q-bearing element is not licensed, and marking is impossible. The process taking place in (5) can be depicted as in (6):

(6)



It appears, then, that the following condition is operative in question formation:[3]

(7) *Q-Marking*
In a question, assign a [+Q] feature to the constituent corresponding to the proposition

2.2. *Q-Scope*

Q-Marking is a constraint about the element to be marked. This section introduces a constraint concerning the elements bearing a Q-feature. Such elements are generally seen as operators that take scope over the proposition. The constraint in (8) expresses that this scope must be indicated overtly.

(8) *Q-Scope*
[+Q] elements must c-command the constituent corresponding to the proposition

It will be clear that there is some overlap in the empirical effects of Q-Marking and Q-Scope. Both principles may trigger WH-movement. However, as we will show below, there are constructions in which one is crucially satisfied, while the other is not. For example, movement of a

[3] Throughout, we will speak of the process as Q-marking and of the constraint as Q-Marking.

WH-expression without accompanying head movement will result in a structure that violates Q-Marking, but satisfies Q-Scope (for this WH-expression). Moreover, partial overlap in the effects of conditions is not to be regarded as a conceptual disadvantage. There is no reason to believe that every condition has completely complementary effects to every other condition. This would mean that ungrammatical structures must always violate exactly one condition, clearly an undesirable demand.

2.3. *Stay*

The third and last constraint that will be relevant is (9). This condition states that movement is costly. In this respect it is similar to Chomsky's (1995) Minimal Link Condition. However, following Grimshaw (1997), we have formulated it as an absolute ban on movement. This is because, in an optimality-theoretic framework, it is unnatural to formulate the constraint as 'minimize movement' since minimization is an effect of the general effort to minimize constraint violation.

(9) *Stay*
Do not move

We will interpret this condition in such a way that the longer the distance between chain links, the more violations of Stay result. (This differs from Grimshaw's version, according to which one movement induces as many violations as it creates traces.)

It is an open issue how distance in chains should be measured. The most straightforward interpretation is that each node in the path between two chain links results in a violation of Stay. Length of chains is defined in (10) (see Collins 1994 for a similar approach).

(10) *Length*
The length of a chain is the (total) cardinality of the path(s) that connect the head of the chain and the foot of the chain, such that there are no paths that connect the head and the foot with a lower (total) cardinality.

We assume that, in calculating the cardinality of a path, segments of a single category count only once. So, a path ⟨X, Y, Y, Z⟩ is as long as a path ⟨X, Y, Z⟩. The notions 'path' and 'connect' as they occur in (10) are defined as below. (We assume connectedness to be a symmetrical and transitive relation.)

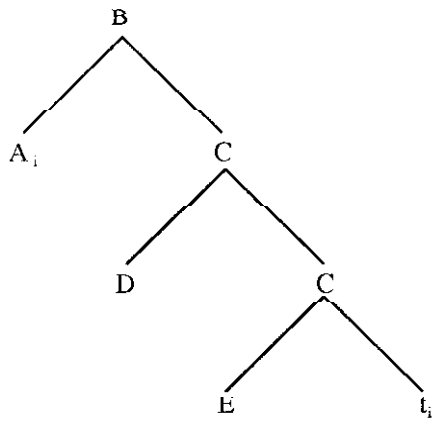
(11) *Path*
A path is an ordered set of nodes $\langle N_1\ N_2\ N_3 \ldots N_m \rangle$ such that, if N_n and N_{n-1} are contained in this set, N_n immediately dominates N_{n-1}.

(12) *Connectedness*
a. A node N is connected to a path P if and only if there is a node in P that immediately dominates N.

b. A path P is connected to a path Q if and only if there is a node N that is contained in both P and Q.

In order to see how this works out, consider the case of simple upward movement depicted in (13) (which might be a case of NP raising in a VP containing an adjunct).

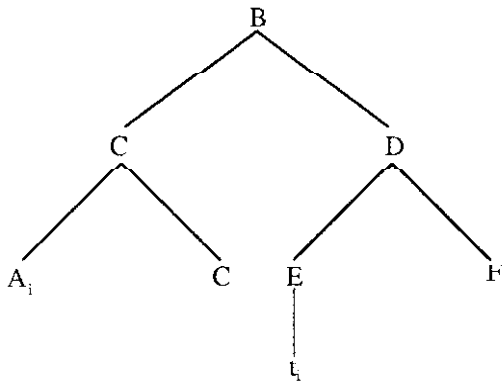
(13)



There is a single path connecting A and its trace, namely ⟨B, C, C⟩. This set of nodes is a wellformed path because B immediately dominates the higher segment of C, while this segment immediately dominates the lower segment of C. The antecedent A is connected to this path since it is immediately dominated by B; the trace t is connected to this path since it is immediately dominated by (the lower segment of) C. The length of the chain between A and t is two, because the two segments of the single category C count only once. Hence, this movement results in two Stay violations.

Next, consider the slightly more complicated case in (14) (which might depict head-to-head adjunction).

(14)



In this structure, there is no single path connecting A and t, because there is no set of nodes between A and t such that each of these nodes immediately dominates the next. Instead, A and t are connected by two paths: P_1 ⟨B, C⟩ and P_2 ⟨B, D, E⟩. A is connected to P_1, t is connected to P_2, and P_1 and P_2 are connected because they both contain B. Hence, the length of the chain between A and t is five.

2.4. *The Candidates*

After having introduced the relevant constraints, we need to define the candidate set. We assume that sentences belong to the same candidate set if they are projected from the same set of lexical items (the same numeration) and target nondistinct semantic representations (see for discussion Grimshaw and Samek-Lodovici 1995 and [in a different framework] Reinhart 1994). The idea is that the syntax is a mapping device between the lexicon and semantic representations. The mapping can take place in various ways, yielding various derivations and thus various candidates. The optimal candidate is the representation that best satisfies a number of ranked constraints that operate at one point in the derivation. (In other words, we assume a derivational theory, with evaluation at specific points in the derivation, that is, at levels of representation.)

For all the constraints introduced above, the relevant level of representation is surface structure. Q-Marking requires that questions are overtly marked as such, Q-Scope requires that Q-bearing elements are in their

scope position at surface structure and Stay restricts overt movement.[4] One can think of constraints of this type in two ways: either as S-structure constraints (re-introducing this level of representation) or as PF constraints (stretching the subject matter of this level of representation). We will adopt the former option here.

The notion of candidate set adopted here has several consequences. Trivially, two sentences projected from different lexical items are not part of the same candidate set. Two sentences that target different interpretations are not in competition either. In the same vein, uninterpretable sentences cannot block derivations that do lead to an interpretation because such sentences belong to a different candidate set (if they belong to a candidate set at all). Finally, lack of interpretation is nondistinct from any particular semantics, which implies that candidates without interpretation may compete with meaningful candidates.

3. Root Questions

In this section we will show that reranking the constraints introduced above derives all patterns of question formation across languages and that it does not derive unattested patterns. For the moment we will restrict our attention to root questions. Embedded questions, which give rise to some extra complications of their own, are discussed in section 4.

3.1. *English*

Consider how the constraints interact in a simple English question like *what have you seen*. In English, any question is Q-marked, so Q-Marking must be high in the constraint hierarchy. In particular, it must be ranked above Stay, or we would not expect WH-movement. This is shown in the tableau in (15), where Q-Scope is ordered lowest for reasons to be discussed below.[5]

[4] It is possible that Stay also restricts LF-movement; we cannot discuss here whether this is the case.

[5] We assume throughout that auxiliaries and main verbs form a complex predicate at the beginning of the derivation (cf. Ackema 1995). This means that movement of an auxiliary requires excorporation, whereas movement of a main verb does not. Thus, moving an auxiliary induces one extra Stay violation. We will ignore this, since it does not discriminate between candidates. Constructions with and without an auxiliary are not in competition.

(15) *English Simple Questions*

	Q-Marking	Stay	Q-Scope
☞ What have [you t seen t]		*******	
[You have seen what]	*!		*
What [you have seen t]	*!	**	
Have [you t seen what]	*!	***	*

The sentence *what have you seen* violates Stay seven times: three times because the path ⟨F′, VP, V′⟩ connecting *have* and its trace contains three nodes and four times because the path connecting *what* to its trace consists of ⟨FP, F′, VP, V′⟩ (see (6)). Q-Marking is satisfied, however. Due to spechead agreement in FP, *have* acquires a Q-feature with which it marks its VP-complement. All other candidates fatally violate Q-Marking. For the second one, this is immediately clear, since nothing has been moved. In the third one, *what* has been adjoined to VP (thus complying with Q-Scope), but an adjunction structure is not a proper structure for marking (only a head-complement structure is). In the last candidate, a head has been fronted, but this does not inherit a Q-feature, due to lack of movement of *what*.

Note that it follows that there will be no language in which verb movement is triggered in WH-sentences (as it is in English), but in which the WH-element itself remains *in situ* (as in Chinese). Since moving the head without moving the WH-element does not lead to any improvement with respect to either Q-Marking or Q-Scope, Stay will rule out this possibility regardless of the ranking of these constraints. As far as we know, this prediction is correct.

Let us now turn to multiple questions. The high ranking of Q-Marking again ensures that the head and at least one WH-phrase must move in order to create the proper Q-marking configuration. The question now is what will happen to the other WH-phrase(s). Here, the ranking between Stay and Q-Scope becomes relevant. If Stay is ranked higher than Q-Scope, as in the tableau in (16), it follows that the other WH-phrases remain *in situ*. (Under the reverse order, one would expect all WH-elements to move out of VP.)

[6] The way in which this number of violations is derived will become clearer in section 3.2, when Bulgarian multiple questions are discussed. It should be clear, however, that moving *what* is worse than leaving it *in situ* as far as Stay is concerned.

(16) *English Multiple Questions*

	Q-Marking	Stay	Q-Scope
☞ Who has [t t seen what]		******	*
What has [who t seen t]		*******!	*
Who what has [t t seen t]		*******!***[9]	
Has [who t seen what]	*!	***	**

Although Stay is of course violable, it has its effects. It does not only account for the fact that all WH-elements but one remain *in situ*, but also for the fact that the one WH-element that *is* moved is the one which makes the shortest possible move, i.e., the subject in the tableau above.[7] In general, superiority effects follow from the global evaluation of Stay (or Shortest Steps, as argued by Golan 1993 and Reinhart 1994; a very similar analysis was proposed by de Haan 1979, pp. 157ff., based on his Minimal String Principle). Some additional examples are given below. In (17), the DP must be fronted since it c-commands the PP in the base, hence it makes the shortest move (see Larson 1988 and Reinhart 1994). In (18) (from Barss and Lasnik 1986), the indirect object must be fronted since it c-commands the direct object.[8,9] The account straightforwardly carries over to (19) (from Reinhart 1994; see also Pesetsky 1982)

[7] Presumably, a WH-subject does not move at all in English, given the lack of *do*-support. This can be explained if Q-Marking in fact requires that a Q-feature is present on the projection to be marked. In that case, no movement is necessary with a WH-subject, since by spec head agreement and consequent feature percolation, its Q feature will be transferred to VP. We cannot go into this issue here.

[8] As is well known, there is an argument-adjunct asymmetry in English multiple questions: *how did John fix what* vs. **what did John fix how*. If this were a case of superiority, it would directly follow from the analysis adopted here, since objects in English are sisters to the verb, whereas adverbials are attached higher. Hence, the adverbial makes the shortest move. However, it is doubtful that the relevant asymmetry has anything to do with superiority. As Reinhart (1994) notices, non-D-linked adjunct WHs in English can never remain *in situ*, not even when superiority is not involved:

(i)a. *who fainted when you behaved how

b. who fainted when you behaved what way

Reinhart argues that, in contrast to *how*, pronominal WHs like *what* have the same structure as clearly D-linked WHs like *which woman* and that this structure is required for successful interpretation at LF of *in situ* WH-phrases. This does not only explain the argument-adjunct asymmetry but also the contrast between the sentences in (i).

[9] A reviewer notes that extraction out of a dative PP, as in *who did Mary give what to* is grammatical (in contrast to what is usually claimed in the literature). It seems to us that the issue of which extractions are grammatical in dative constructions does not so much bear on the explanation of superiority, rather than on a proper understanding of the syntax of dative constructions. In particular, we think these facts may arise as a consequence of dative

(17)a. Who did John ask for what

b. *What did John ask who for

c. *For what did John ask who

(18)a. Who did you give which book

b. *Which book did you give who

(19)a. Whom did Lucie persuade to visit whom

b. *Whom did Lucie persuade whom to visit

So, constraint ranking is crucial for English. As noted in section 1, however, the most important type of evidence for constraint ranking and global evaluation lies in cross-linguistic variation. This variation should be explicable just by reranking the constraints. We will now try to establish whether the typology of multiple question formation can be accounted for in this way.

3.2. *Bulgarian*

Suppose the constraints proposed in section 2 are ranked as in (20).

(20) Q-Marking ≫ Q-Scope ≫ Stay

The high ranking of Q-Marking has the effect, as in English, that there is head movement plus movement of one WH-phrase to the specifier of FP. Compared to English, however, the ranking of Q-Scope and Stay is reversed. This means that not just one, but all WH-phrases must move out of VP. The shortest possible move for the other WHs is adjunction to VP, as in (21), but in this representation Q-marking is in fact impossible, as we will now argue.

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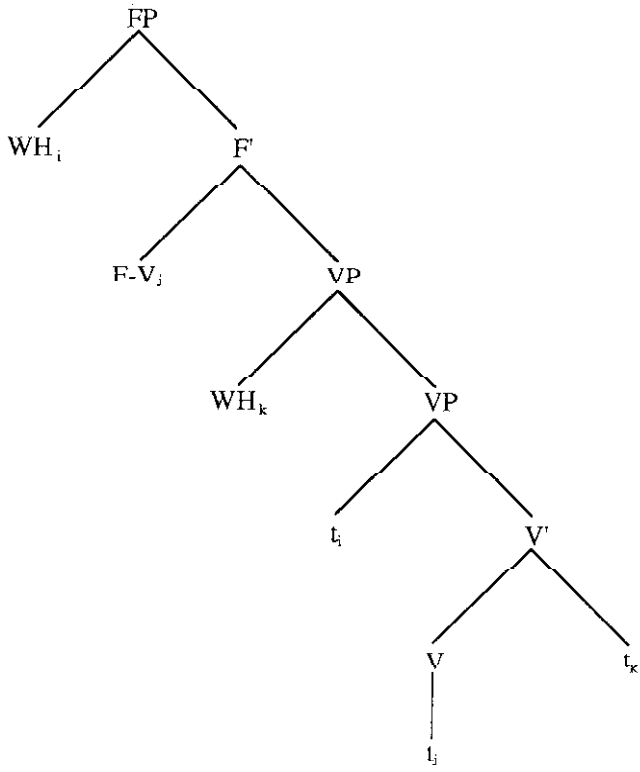
constructions being structurally ambiguous. If there are two different structures, the element that makes the shortest move may be different in each of these. The ambiguity in question has been motivated in den Dikken (1995) and is supported by the fact that Dutch dative constructions, but not double object constructions, allow two orderings of the goal and the theme argument within VP.

(21)



Recall that Q-Marking requires that the constituent corresponding to the proposition is assigned a Q-feature. Up to now we have simply equated this constituent with VP. However, the VP that can be Q-marked in (21) (the upper one) does not correspond to the proposition but to a question. The constituent that does correspond to the proposition is the lower VP, but this is not in a head-complement relation to F.[10]

[10] In counting the length of paths, we assume that segments created by adjunction belong to the same category. A reviewer suggests that this is in conflict with what is assumed here. However, the fact that two segments have different interpretations, as in (21), does not mean that they belong to different syntactic categories. Trivially, the higher and the lower segment of an adjunction structure do not receive the same interpretation, since the higher one contains more material:

(i) John [$_{VP}$ [$_{VP}$ read the book] yesterday]

In (i), the interpretations of *read the book* and *read the book yesterday* are clearly not identical. This does not mean that the segments of VP do not form a single syntactic category. Note that if a VP as in (i) is to be Q-marked there is no problem, since here the higher VP (the sister of the Q-marking head) corresponds to the proposition.

As a consequence, WHs may not adjoin to VP if Q-Marking is to be satisfied. If they must be moved out of VP, they must move to a position above F. Hence, the effect of the ordering in (20) is that all WH-expressions cluster together in spec-FP.[11] This is formalized in the tableau in (22) (where the brackets indicate VP-boundaries).

(22) *Bulgarian Multiple Questions*

	Q-Marking	Q-Scope	Stay
WH V [t t WH]		*!	******
[WH V WH]	*!	**	
V [WH t WH]	*!	**	***
[WH [WH [t V t]]]	*!		***
WH V [WH [t t t]]	*!		********
☞ WH WH V [t t t]			**********

We therefore predict that some languages have multiple questions structured as in (23).

[11] In principle, there still seems to be another possibility, namely moving one WH to spec-FP to ensure that there will be Q-marking, and adjoining the other WH(s) to FP, as in (i).

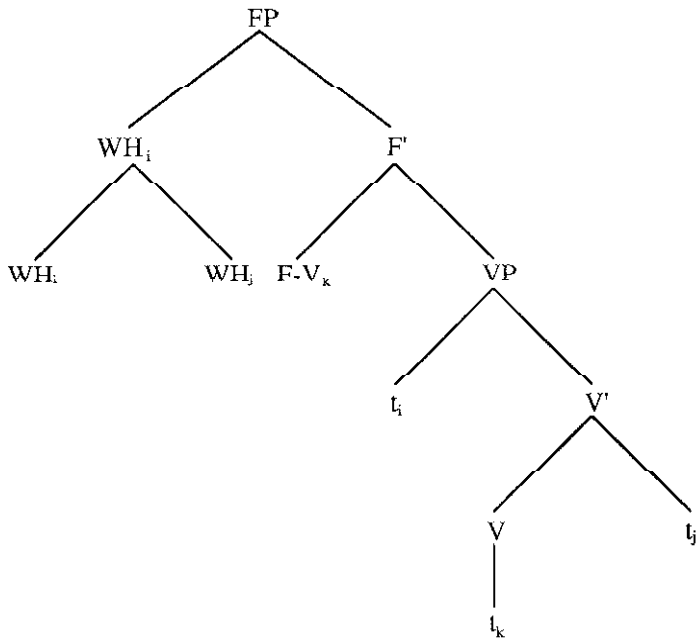
(i) *[FP WH [FP WH [F' . . .

In order to obtain a multiple question interpretation, the lower WH(s) must be unselectively bound by the highest WH-operator (see section 3.4). For independent reasons it must be assumed that WHs in an A'-specifier position must be operators and cannot be bound through the relevant process. In (ii), for example, the WH in the embedded spec-FP cannot be bound by the matrix WH-operator; sentences like this do not have a pair-list reading (cf. van Riemsdijk 1978, p. 230).

(ii) Who knows/wondered what John bought

The structure in (i) is therefore not interpretable as a multiple question, if it is interpretable at all. It therefore falls outside the relevant candidate set.

(23)



This prediction is correct. Languages in question are Bulgarian and Romanian, as argued by Rudin (1988). Rudin cites several pieces of evidence showing that all WH-expressions form an indivisible constituent in spec-CP (here: spec-FP). In Bulgarian, for instance, no WH-expression remains *in situ*:[12]

(24) Koj kogo vižda
who whom sees

Crucially, the WH-cluster cannot be interrupted. This is most clearly shown by the fact that adverbials may not split up the fronted WH-sequence:

(25)a. Zavisi ot tova, koj kogo prŭv e udaril
depends on this who whom first has hit
It depends on who hit whom first.

[12] The examples below are adopted from Rudin (1988). For reasons of exposition, we will restrict our attention to cases with two WH-phrases (subject and object) here, but the results can immediately be extended to cases with more than two WH-phrases.

b. *Zavisi ot tova, koj pŭv kogo e udaril
depends on this who first whom has hit

A second piece of evidence comes from WH-words in free relatives (assuming that the syntax of relatives is parasitic on the syntax of questions, at least in these languages). Relative WH-words must be marked with a definitizing *-to*. All WH-expressions may be affixed separately, but it suffices to add one *-to* at the end of the complete WH-sequence to yield it relative. Adding *-to* to the first WH-constituent only is ungrammatical. As Rudin notes, this suggests that *-to* is suffixed to one WH-constituent, which consists of all fronted WH-phrases:

(26)a. Kojto kakvoto iska . . .
who-DEF what-DEF wants
whoever wants whatever

b. Koj kakvoto iska . . .
who what-DEF wants

c. *Kojto kakvo iska . . .
who-DEF what wants

Another crucial part of the structure in (23) is that there is obligatory verb movement in order to license the functional head needed for Q-marking. This means that, if the subject is not a WH-element itself, there should be obligatory inversion in WH-questions. This is correct. As noted by Kraskow (1992), languages of the Bulgarian type do indeed display obligatory inversion in questions:[13]

(27)a. Kakvo kupuva Ivan
what buys John
What does John buy?

b. *Kakvo Ivan kupuva
what John buys

[13] There is some discussion in the literature as to which functional projection the verb and the fronted WHs move to (see Izvorski 1995). As remarked above, the labeling of functional projections is a non-issue in the theory of clause structure adopted here (see Ackema et al. 1993). The crucial fact is that the subject cannot appear between the fronted WHs and the verb. Roumyana Izvorski (p.c.) confirms that this is indeed the case.

It seems, then, that the syntax of Bulgarian WH-questions indeed follows from the ranking in (20) of the constraints proposed in section 2.

A further striking characteristic of the WH-sequence in Bulgarian is that it displays superiority-like effects. While in English multiple WH-questions a WH-subject will be the element that is overtly moved, in Bulgarian a WH-subject must precede all other fronted WH-elements (cf. 28).

(28)a. Koj kogo vižda
who whom sees

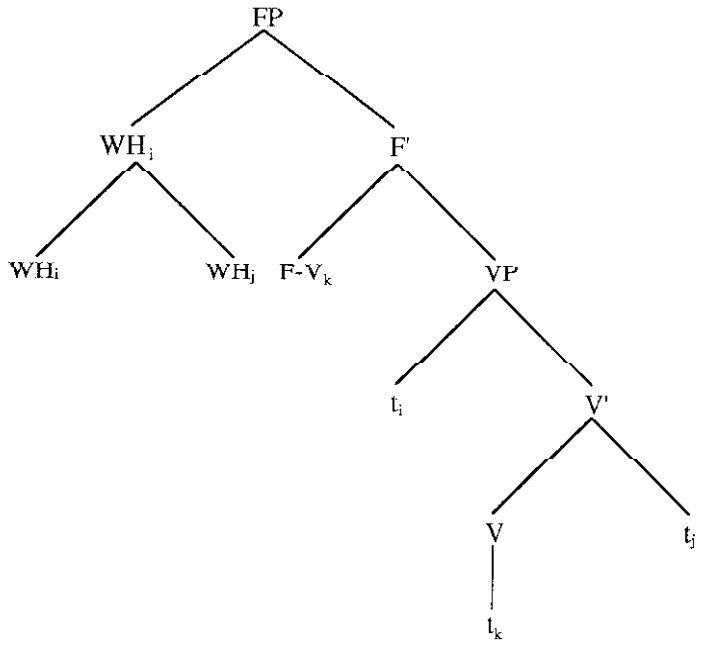
b. *Kogo koj vižda
whom who sees

We will now argue that this is an indirect effect of the lowest constraint in Bulgarian, Stay. This is an illustration, therefore, of the fact that low-ranked constraints can still have their effects when the different candidates are equal with respect to all the higher constraints (and (28a–b) both maximally satisfy Q-Marking and Q-Scope).

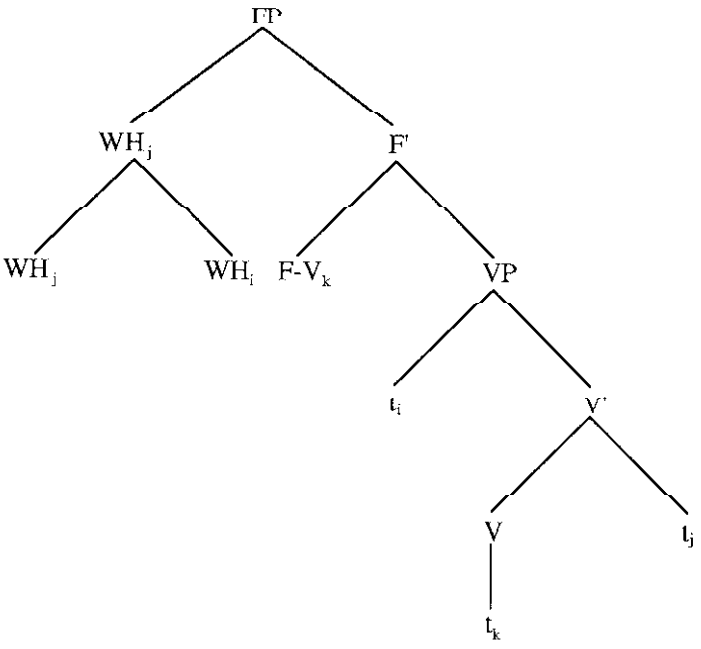
What (28) indicates is that the relation between subject and object in the WH-cluster is asymmetric. Either the subject must be adjoined to the object, in which case (28) shows that WH-phrases must be left-adjoined, or the object must be adjoined to the subject, in which case WH-phrases must be right-adjoined. However, there cannot be optionality as to which WH-phrase adjoins to which, since free word order is predicted then, even when assuming a uniform direction of adjunction. According to Rudin, the WH-cluster is headed by the subject, with the other WH-phrases right-adjoined to it. We will now show that this indeed follows from Stay in our analysis.

Suppose that both WH-phrases move to spec-FP independently. No matter whether the subject is moved first, and the object adjoined to it (cf. 29a), or the other way around (cf. 29b), Stay is violated equally.

(29)a.


FP
WH$_i$
F'
WH$_i$
WH$_j$
F-V$_k$
VP
t$_i$
V'
V
t$_j$
t$_k$

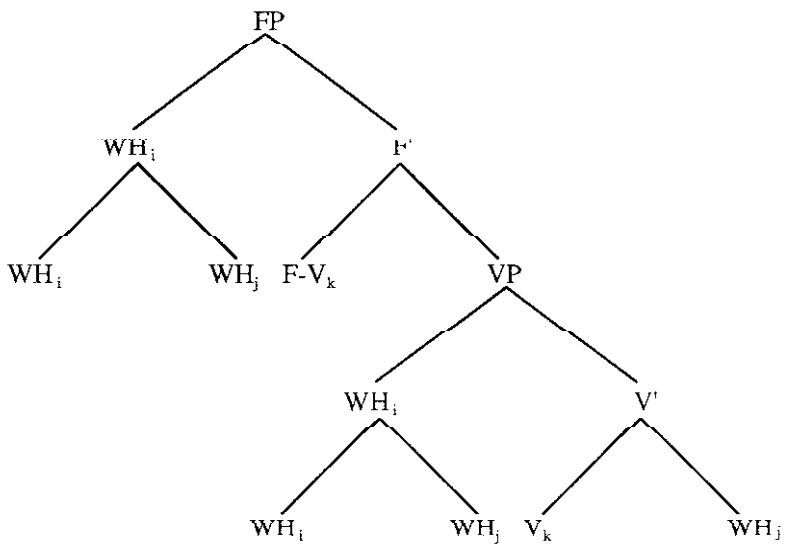
b.


FP
WH$_j$
F'
WH$_j$
WH$_i$
F-V$_k$
VP
t$_i$
V'
V
t$_j$
t$_k$

The paths that connect antecedents and traces in (29a) are ⟨F′, VP, V′⟩ for the moved verb, ⟨FP, F′, VP⟩ for the moved subject, and the two paths ⟨FP, WH$_i$⟩ and ⟨FP, F′, VP, V′⟩ for the moved object. In (29b) the paths are ⟨F′, VP, V′⟩ for the verb, ⟨FP, F′, VP, V′⟩ for the object, and ⟨FP, WH$_j$⟩ plus ⟨FP, F′, VP⟩ for the subject. In both cases, twelve Stay violations result. If these were the only options, we would therefore predict optionality as to which WH-phrase adjoins to which, while we just noted that this cannot be correct.

However, there is another option to derive the correct structure for a multiple WH-question in Bulgarian, which scores better on Stay. This option consists of first adjoining the WH-object to the WH-subject and then moving this cluster as a whole to spec-FP (a similar analysis is proposed independently by Grewendorf and Sabel 1996). The point is that moving the two WH phrases together, as one constituent, is cheaper than moving them apart over the same distance. This is illustrated in (30), where for clarity we have spelled out the internal structure of the traces (we assume the copy theory of movement, cf. Chomsky 1995).

(30)



The paths we now obtain are the following: ⟨F′, VP, V′⟩ for the moved verb, ⟨VP, WH$_i$⟩ and ⟨VP, V′⟩ for the moved object, and ⟨FP, F′, VP⟩ for the moved WH-cluster. This results in ten violations of Stay and it therefore is better than either of the options in (29).

The derivation in (30) crucially depends on adjunction of the object to

the subject, thus explaining the asymmetry in the WH-cluster.[14] The correct word order then follows from uniform right-adjunction of WH-phrases, as proposed by Rudin.[15]

To conclude the section, it should be noted that the constraint ranking in (20) is not the only one which results in the Bulgarian pattern of question formation. Reversing Q-Scope and Q-Marking has no effects, as long as Stay is ranked lowest. This is illustrated by the tableau in (31). Compared to (22), the columns for Q-Scope and Q-Marking are reversed.

(31) *Bulgarian Multiple Questions (Alternative Ranking)*

	Q-Scope	Q-Marking	Stay
WH V [t t WH]	*!		******
[WH V WH]	*!*	*	
V [WH t WH]	*!*	*	***
[WH [WH [t V t]]]		*!	***
WH V [WH [t t t]]		*!	********
☞ WH WH V [t t t]			*********

Q-Scope dictates that all WHs must move out of VP. The derivation that complies best with Stay would involve adjunction of the WHs to VP, without head movement. But since Q-Marking outranks Stay, the syntactic configuration for Q-marking must be derived. This can only be achieved by head movement plus WH-movement of a WH to spec-FP. For reasons

[14] Note that first adjoining the subject to the object and then moving the whole cluster to spec-FP is ruled out by GEN's ban on downward movement, even though it also results in ten Stay violations. Note further that the derivation proposed here is not an instance of downward movement, given that the WH-object c-commands its trace according to the definition of c-command in Chomsky (1986) (the WH-subject does not block c-command, as not every segment of it dominates the WH-object). Another issue is whether the proposed movement obeys strict cyclicity. As it does not extend the phrase marker, it violates Chomsky's (1995) version of this condition. Some relaxation of the condition was already required, however, in order to allow for head-to-head adjunction. We therefore propose that cyclic domains, like c-command relations, are defined in terms of dominating categories (rather than dominating segments). This will allow both head-to-head movement and the adjunction proposed here.

[15] This also correctly predicts Rudin's (1986) observation that the order of three fronted WH-phrases in double object constructions usually corresponds to the one established in the base (see also Mulders 1996). There are some cases where left-adjunction of WHs may be possible as well, namely in those cases that do allow for more than one order of the WH-elements. Alternatively, this optionality may originate in different underlying orders of the objects. (The phenomenon does not occur with WH-subjects in relation to other WHs.) See Billings and Rudin (1996) for discussion of the pragmatic factors involved in ordering WH-objects.

outlined above, the other WHs must then move to spec-FP as well (if they have to move out of VP in the first place), or Q-marking is blocked after all. Hence, the same pattern appears.

From the six possible rankings of the three constraints, three have now been discussed, leading to two different patterns of WH-question formation. The ranking Q-Marking ≫ Stay ≫ Q-Scope leads to movement of the verb and one WH, as in English. The rankings Q-Marking ≫ Q-Scope ≫ Stay and Q-Scope ≫ Q-Marking ≫ Stay lead to clustering of the WHs in spec-FP and supporting verb movement, as in Bulgarian. In the next section we will discuss a third pattern, derived from yet another ranking.

3.3. *Czech*

Suppose the constraints are ranked as in (32).

(32) Q-Scope ≫ Stay ≫ Q-Marking

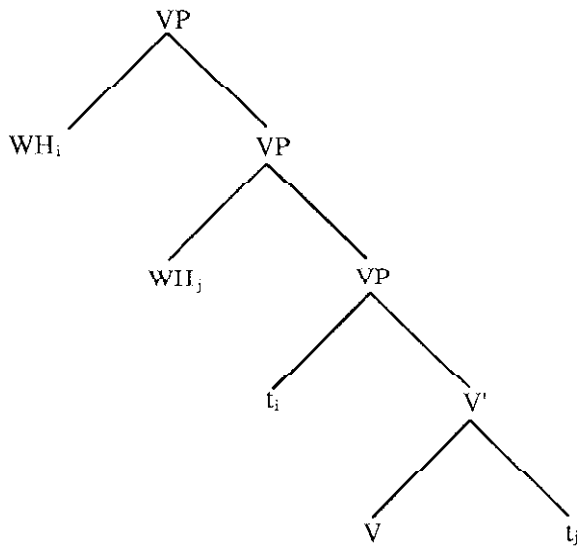
The high ranking of Q-Scope dictates that all WH-phrases be moved out of VP, as in Bulgarian. But in (32) Stay outranks Q-Marking, so it is more important to minimize movement than it is to derive the proper Q-marking configuration. As noted in section 3.2, the derivation that satisfies Q-Scope for all WHs and that minimally violates Stay is one in which all WHs are adjoined to VP and in which there is no head movement:

(33) *Czech Multiple Questions*

	Q-Scope	Stay	Q-Marking
WH V [t t WH]	*!	******	
[WH V WH]	*!*		*
V [WH t WH]	*!*	***	*
☞ [WH [WH [t V t]]]		***	*
WH V [WH [t t t]]		****!****	*
WH WH V [t t t]		****!******	

So, the optimal candidate under the relevant ranking is structured as in (34).

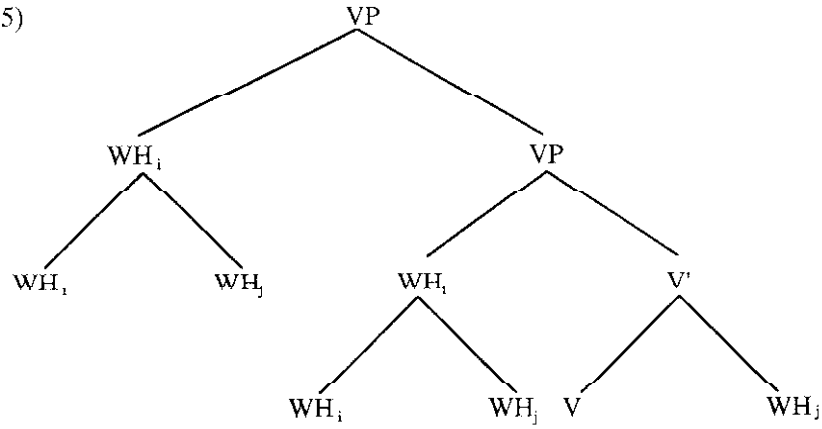
(34)



This representation violates Stay three times. The path between the moved subject-WH and its trace consists of VP-segments only. As proposed in section 2.3, crossing segments of a single category does not lead to more than one violation. The path between the object-WH and its trace consists of two VP-segments and V′, and hence induces two violations.

In the previous section, it turned out to be cheaper with respect to Stay to first adjoin the object-WH to the subject-WH and then move this cluster out of VP. One might expect that a derivation like this is cheaper as well in the grammar under discussion. However, when WH-movement is adjunction to VP, clustering the WHs and then moving them together is in fact more costly. Such a derivation results in the following tree (with the traces spelled out):

(35)



The path for the moved WH-cluster is ⟨VP, VP⟩, while the paths relevant to the moved object are ⟨VP, WH_i⟩ and ⟨VP, V′⟩. This amounts to five Stay violations, two more than in the optimal candidate in (34).[16]

So, the ranking in (32) defines a grammar in which all WHs are fronted, but in which they do not form a cluster. As Rudin (1988) argues, there are indeed languages of this type. Examples are Czech and Polish. Restricting our attention to Czech, it can be observed that all WH-expressions must be fronted:

(36) Kdo koho viděl
who whom saw
who saw whom

Unlike in Bulgarian, however, elements can appear between the fronted WH-expressions. Czech has clitics that must always follow the first major constituent of the clause (cf. Toman 1986). These clitics always follow the first WH-word in multiple WH-constructions (see Rudin 1988). This indicates that the WH-expressions are separate constituents:

(37)a. Kdo ho kde viděl je nejasné
who him_{CL} *where saw is unclear*
it is unclear who saw him where

b. *Kdo kde ho viděl je nejasné
who where him_{CL} *saw is unclear*

Moreover, parentheticals can appear anywhere in the WH-sequence in Czech. This is shown in (38) (Rudin's 49):

(38)a. Kdo, podle tebe, co komu dal
who according to you what to whom gave
who, according to you, gave what to whom

[16] Clustering is also suboptimal for the objects in a double object construction. This may require a slight adaptation of the definition of length of movement if Larson's (1988) VP-shell analysis should be extended to Czech (VP-shells are argued to be a language-specific option in Neeleman and Weerman 1997). If Czech has VP-shells, clustering seems to induce as many Stay Violations as separate movement in case of two WH-objects. This can be remedied by increasing the cost of movements that result in antecedents which do not strictly c-command their trace, but only via segments of another category (cf. also note 14). Such movements always involve chains of which the antecedent and the foot are not connected by a single path (see section 2.3). Adapting the way in which the cardinality of composed paths is determined may therefore have the desired result. Since it is unclear whether Czech double object constrictions indeed involve VP-shells, we will not further pursue this issue here.

b. Kdo co, podle tebe, komu dal
who what according to you to whom gave

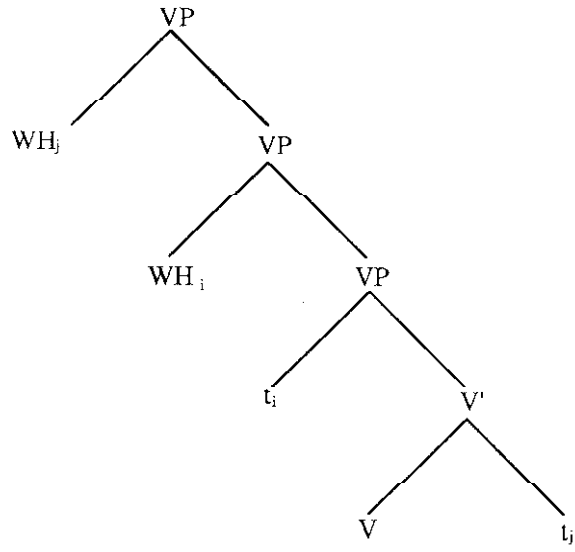
The same phenomenon occurs with adverbials. (Except where indicated, the Czech data below were provided by Ludmilla Menert, p.c.)

(39)a. Kdo rychle co komu dal
who quickly what to gave
Who quickly gave what to whom

b. Kdo co rychle komu dal
who what quickly to whom gave

From the proposed ranking for Czech it does not only follow that the WH-words do not form a cluster, but also that no superiority effects should exist. Whereas in the Bulgarian WH-cluster the subject-WH precedes the other WHs, in a grammar defined by (32) the order between the fronted WHs should be free. This is because the number of Stay violations will be the same when all WH-words adjoin separately to VP, regardless of the order in which they are moved. Compare the tree in (40) with the one in (34). In (34) the object was adjoined before the subject. In (40) the order of adjunction is reversed.

(40)



There is no difference in the total length of the paths connecting the

subject and the object to their traces. In (40) the paths are ⟨VP, VP⟩ for the subject and ⟨VP, VP, VP, V′⟩ for the object, giving three violations in total, just as in (34). We thus predict that in Czech type languages there is free word order between the WHs (modulo possible stylistic preferences). In particular, it should be the case that the subject-WH is freely ordered with respect to the other WHs. This prediction is borne out. Alongside (36), (41) exists.

(41) Koho kdo viděl
whom who saw
who saw whom

Another crucial property of the optimal candidate in Czech is that, contrary to English and Bulgarian, there is no verb movement (since the proper structure for Q-marking need not be derived). It is predicted therefore that there is no obligatory inversion in questions with a non-WH-subject. As noted by Kraskow (1992), the correlation between (absence of) clustering and (absence of) verb movement in languages with multiple WH movement indeed exists. Compare (42) with (27).[17]

(42)a. Co kupuje Ivan
what buys John
What does John buy?

b. Co Ivan kupuje
what John buys

In sum, our analysis of Czech multiple WH-questions correctly predicts that the fronted WHs do not form a cluster, that they are ordered freely, and that there is no verb movement. We may conclude, therefore, that the fourth possible ranking of the constraints proposed in section 2 results in an existing type of question formation as well. In the next section we will show that the remaining two possible rankings lead to one more type, which is also attested.

[17] Note that inversion is possible, but this is not due to verb movement, since Czech has free subject inversion of the Italian type:

(i)a. Včera Jan koupil knihu
Yesterday John has-bought book
John has bought a book yesterday.

b. Včera koupil knihu Jan
Yesterday has-bought book John

3.4. *Chinese and Japanese*

Suppose the constraints proposed in section 2 are ranked as in either (43a) or (43b), the two remaining possibilities.

(43)a. Stay ≫ Q-Marking ≫ Q-Scope

b. Stay ≫ Q-Scope ≫ Q-Marking

The high ranking of Stay ensures that it is more important not to move than it is to satisfy Q-Marking or Q-Scope. The result is that all WH-expressions must remain *in situ* in grammars defined by (43) (see the tableau in (44), in which the ranking between Q-Marking and Q-Scope is irrelevant).

(44) *Chinese Multiple Questions*

	Stay	Q-Scope	Q-Marking
WH V [t t WH]	*!*****	*	
☞ [WH V WH]		**	*
V [WH t WH]	*!**	**	*
[WH [WH [t V t]]]	*!**		*
WH V [WH [t t t]]	*!*******		*
WH WH V [t t t]	*!*********		

As is well known, languages of the predicted type exist. According to Huang (1982), Chinese is an example. In root as well as embedded questions, WH-expressions remain in their base position:

(45)a. Ni xihuan shei
you like who
who do you like?

b. Wo xiang-zhidao Lisi mai-le sheme
I wonder Lisi bought what
I wonder what Lisi bought.

At this point, the question becomes relevant how WHs *in situ* are interpreted. We assume, following Reinhart (1994), that they can be assigned scope via a process reminiscent of unselective binding (we will sometimes use this term for expository reasons). This process requires the presence of a Q-operator that takes scope over the clause and on which

the lower WH-phrases can be parasitic. So, the LF of an English question like (46a) is as in (46b) under a pair-list reading:

(46)a. [Which persons]$_i$ did you ask [whether John read what]

b. Which$_{\langle i,j \rangle}$ did you ask [t_i persons] [whether John read what$_j$]

As Reinhart notes, this analysis straightforwardly explains why in English WHs *in situ* are not subject to Subjacency: no movement is necessary for their interpretation, not even at LF. The assumption that covert movement is exceptional in that it is not subject to Subjacency is hence unnecessary and can be discarded.[18]

In the English example above *which* (*persons*) functions as the Q-bearing operator on which the other WH-expression, *what*, can be parasitic. In languages like Chinese and Japanese, however, there is no overt WH-movement and consequently one WH-expression must move covertly to supply the required operator. After the movement of this one WH, possible other WH-expressions can be interpreted *in situ* through the operation proposed by Reinhart. So, an S-structure like (47a) is mapped into a representation like (47b) at LF:[19]

(47)a. [$_{VP}$ . . . WH . . . WH . . .]

b. WH$_{\langle i,j \rangle}$ [$_{VP}$ . . . t_i . . . WH$_j$ . . .]

The prediction that in languages with no overt movement one WH must move covertly while the rest remains *in situ* is corroborated by data presented by Watanabe (1992). Under the null hypothesis that LF movement is subject to Subjacency, we expect that the one WH that covertly moves in Japanese is restricted by this condition, whereas the interpretation of the other WHs is not. This is exactly what Watanabe observes. Consider the contrast in (48).[20]

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[18] The assumption that Subjacency holds of LF-movement is inevitable if it is part of GEN; see note 2.

[19] On apparent ECP effects with adjunct WHs *in situ* (or the lack thereof in certain languages) see Reinhart (1994), Aoun and Li (1993) and Cole and Hermon (1994).

[20] The examples in (48) show that in Japanese questions Q-bearing heads are present. According to Cheng (1991), this property correlates with WH-*in-situ*. Given our analysis, such heads cannot be a necessary ingredient of a WH-*in-situ* structure (see also section 4.2). Presumably this is just as well, given that Q-bearing heads are absent in the Chinese WH-*in-situ* structures in (45). Moreover, Q-bearing heads may be present in languages that have overt WH-movement: see the Dutch example in (49a) and the Indonesian ones in (68). Colloquial French is particularly striking in this respect. It has both WH-*in-situ* and WH-movement patterns (see section 5.2); Q-bearing heads can be inserted in combination with overt movement (cf. 70), but are absent in *in-situ* constructions (cf. 65b).

(48)a. ??John-wa [Mary-ga nani-o katta ka dooka] Tom-ni
John-TOP Mary-NOM what-ACC bought whether Tom-DAT
tazuneta no?
asked Q
What did John ask Tom whether Mary bought?

b. John-wa [Mary-ga nani-o katta ka dooka] dare-ni
John-TOP Mary-NOM what-ACC bought whether who-DAT
tazuneta no?
asked Q
Who did John ask whether Mary bought what?

Since the scope of the question is the matrix clause in these examples, one WH-expression must move covertly to provide an operator in the proper scope position. If so, the ungrammaticality of (48a) is explained if *what*, being the only Q-bearing element in the construction, must indeed be (covertly) moved out of the WH-island induced by *whether*. The grammaticality of (48b) is explained as well: it follows from the presence of a WH-phrase in the matrix clause. This phrase can introduce the relevant Q-operator, so, that *what* can remain *in situ* at LF and be interpreted in the way described by Reinhart.[21]

4. Embedded Questions

The difference between root clauses and embedded clauses concerns the presence of a complementizer in the latter. In this section we will consider which consequences this has for the formation of questions.

[21] This is not what Watanabe concludes. He assumes, following Huang (1982), that overt and covert movement fundamentally differ in that only the former is subject to Subjacency. This means that the Subjacency effect in (48a) gives evidence for S-structure movement. Watanabe argues that at S-structure a null operator moves, while the (overt part of the) WH-expression remains *in situ* throughout the derivation (cf. also Aoun and Li 1993 on Chinese). Watanabe rejects analyses of the type assumed in the text (i.e., LF movement of one WH but not the others, with Subjacency holding also for covert movement), on the basis of evidence suggesting that spec-CP in embedded questions is already filled at S-structure. The evidence is based on the occurrence of Subjacency effects with certain overt movements in Japanese. However, it is rather inconclusive. Watanabe notes that Subjacency effects are lacking with the most straightforward type of overt movement in Japanese, namely scrambling, and that an alternative explanation can be given for most of the supposed S-structure Subjacency effects.

4.1. *The Absence of Verb Movement in Embedded Questions*

In general, the analyses presented above carry over straightforwardly to embedded questions. The most important difference concerns languages in which Q-marking is required. In root clauses in such languages, WH-movement has to be accompanied by verb movement in order to provide the head that Q-marks VP (cf. sections 3.1 and 3.2). If such a head is already present in the form of a complementizer, verb movement is unnecessary and hence suppressed by Stay. This effect can be observed in the Dutch examples in (49), where the verb indeed remains *in situ*.

(49)a. Ik vraag me af wat$_i$ of Jan t$_i$ gezien heeft
I wonder REFL PRT *what if John seen has*

b. *Ik vraag me af wat$_i$ of heeft$_j$ Jan t$_i$ gezien t$_j$
I wonder REFL PRT *what if has John seen*

The contrast between root questions and embedded questions carries over to other languages in which Q-Marking must be satisfied. This is illustrated for English in (50).

(50)a. I wonder what$_i$ John has seen t$_i$

b. *I wonder what$_i$ has$_j$ John t$_j$ seen t$_i$

An unexpected feature of the examples in (50) is that the complementizer, which we claim acts as the Q-marking head, seems to be absent. Indeed, in Dutch too, the complementizer in (49) is usually omitted. The phenomenon of complementizer omission in such cases is usually referred to as the doubly-filled-COMP filter (cf. Chomsky and Lasnik 1977). Two types of analyses for this phenomenon have been proposed. Either one assumes that there is no complementizer at all, or that there is a complementizer that remains unrealized at PF. As should be clear, our analysis forces us to adopt the second position.

Of course, the assumption that there is an unpronounced complementizer in embedded questions like (50a) must be accompanied by an analysis of why it remains unpronounced. Within an optimality-theoretic framework, such an analysis has already been presented by Pesetsky (1995).

A simplified version of Pesetsky's account runs as follows. PF contains two constraints that jointly have the effect of what is traditionally known as the doubly-filled-COMP filter. These two constraints are dominated in English by the familiar recoverability condition on deletion. The facts

can then be derived as follows. In an embedded clause like (50a), the complementizer is deleted in order to satisfy the doubly-filled-COMP filter. The WH-element cannot be deleted since its semantic content is not recoverable, but the Q-feature inherited by the complementizer is recoverable from the WH-element:

(51) *Embedded WH-questions*

/WH C/	Recoverability	*Doubly-filled COMP
WH C		*!
∅ C	*!	
☞ WH ∅		

In contrast, the complementizer may not be deleted in an embedded yes/no question like (*I wonder*) *if John has seen anything*, because its Q-feature would not be recoverable:

(52) *Embedded yes/no-questions*

/C/	Recoverability	*Doubly-filled COMP
C		
☞ ∅	*!	

In root WH-questions, the doubly filled COMP filter must be violated, since neither the content of the moved verb nor that of the WH-operator would be recoverable after deletion:

(53) *Root WH-questions*

/WH V/	Recoverability	*Doubly-filled COMP
☞ WH V		*
∅ V	*!	
WH ∅	*!	

Finally, the account sketched here can be extended to unembedded yes/no-questions. Such cases pose a problem that is the reverse of the problem posed by embedded WH-questions. In *has John seen anything*, for example, there is a head but there does not seem to be a Q-bearing operator. In this case, it is the Q-operator that is deleted in order to satisfy the doubly-filled-COMP filter (cf. Baker 1970 on empty Q-operators). This

is allowed by Recoverability, since it does not have semantic content other than its Q-feature, which has been copied onto the verb. Again, the verb's semantic content (e.g., its tense) is not recoverable and it may therefore not be deleted:

(54) *Root yes/no-questions*

/Op V/	Recoverability	*Doubly-filled COMP
Op V		*!
☞ ∅ V		
Op ∅	*!	

Reranking of the constraints proposed by Pesetsky should derive cross-linguistic variation with respect to the doubly-filled-COMP filter. We will not pursue these issues here, assuming that the solution suggested above, or something like it, is correct.[22]

4.2. *The Presence of WH-Movement in Embedded Questions*

So, the insertion of a complementizer blocks verb movement in embedded WH-questions. If the complementizer bears a Q-feature of its own, one may wonder why WH-movement is not blocked as well in languages where such movement is triggered by Q-Marking. A sentence like (55a) seems to satisfy Q-Marking via *if* and hence it should block (55b) because of Stay.

---

[22] In a verb-second language like German, some embedded clauses allow verb movement instead of complementizer insertion (cf. ia). An anonymous reviewer points out that, nevertheless, verb movement is impossible in embedded WH-sentences (cf. ib).

(i)a. Er sagte mir [den Fritz habe er nicht gesehen]
he told me the Fritz would-have he not seen

b. *Er sagte mir [wen habe er gesehen]
he told me who would-have he seen

A semantic explanation might be in order here. Embedded verb movement in German seems to be possible only when a certain attitude towards the truth of the proposition expressed by the embedded clause is expressed. Note, for instance, the subjunctive inflection on the embedded verb in (ia). Furthermore, next to cases involving indirect quotations like (ia), the predicates that the reviewer mentions as being compatible with verb movement in their complement include *glauben* 'believe', *denken* 'think' and *mir scheint* 'it seems to me', which explicitly express that the speaker is assessing the truth value of the complement that follows. Since questions do not have a truth value, an attitude towards their truth does not seem to make sense. This may well be the source of the impossibility of embedded V2 with WH-questions.

(55)a. *Mary wonders if John loves who

b. Mary wonders who if John loves
↓
Ø

Note that (55a) is in fact well-formed as an embedded yes/no-question (with an echo reading for the WH-expression). The problem just mentioned can therefore be avoided if it can be argued that this necessarily is the only reading (55a) can get, since if it cannot have the semantics of a WH-question it cannot block WH-questions like (55b) either (they are not in the same candidate set). What we propose, therefore, is that Q-Marking is only satisfied if a question is marked in a way that agrees with its semantics. That is to say, WH-questions and yes/no-questions should be marked as such; the feature make-up of the Q-marking head must match the question type.

This can be implemented as follows. Suppose that Q Marking requires that every Q-feature present in a question be assigned to the proposition via the system of Q-marking. As we have seen earlier, Q-Marking is ranked highest in English and is therefore always maximally satisfied. If the WH-expression in (55a) is not an echo-WH, it contains a Q-feature for which the proposition fails to be marked. Hence, it is suboptimal when compared to (55b). In conclusion, the problem disappears if Q-Marking is reformulated as in (56) (compare with (7)).

(56) *Q-Marking*
Mark the constituent corresponding to the proposition for every [+Q] feature that is present

Note that this formulation has the effect that in multiple questions the constraint is always violated. All WH-phrases must be in a configuration in which VP can be marked with their Q-feature. However, due to limitations on spec-head agreement, in practice only one WH can transfer its feature to the Q-marking head. Even if all WH-expressions move to spec-FP, only one will be heading the specifier of F, with the rest adjoined to it. The other Q-features in the structure therefore induce violations of Q-Marking. This has no consequences for the analysis of multiple questions in the languages discussed in section 3. In a multiple question with two WHs, all candidates induce one extra violation of this constraint, but the relative scores remain the same. Candidates that used to satisfy Q-Marking now violate it minimally, namely once, whereas candidates that used to violate it now violate it twice. Some further evidence for the formulation

in (56) will be provided in section 5.1, where we will argue that it allows for an explanation of the absence of multiple questions in some languages.

4.3. *Czech Embedded Questions*

Another effect of the insertion of a complementizer can be seen in languages like Czech. In section 3.3, we have argued that all WHs in Czech are adjoined to VP. According to Rudin (1988), however, the first WH-expression is moved to spec-CP (FP in our terms). This can, in fact, not be verified for main clauses, because no complementizer is present and as we have seen no verb movement takes place. Given our assumptions about functional structure, this means FP is absent in main clauses. Hence, the initial WH, like the others, is adjoined to VP.

In embedded clauses the situation is different. Rudin assumes that the doubly-filled-COMP filter is active in languages like Czech and Polish. However, Ludmila Menert (p.c.) informs us that colloquial registers in Czech allow co-occurrence of an overt complementizer and a fronted WH-expression:

(57) Chtěl bych vědět . . .
I would like to know

a. *že co Marie četla
that what Mary read

a′. co že Marie četla
what that Mary read

b. *že komu co Marie dala
that who what Mary gave

b′. komu že co Marie dala
who that what Mary gave

b″. *komu co že Marie dala
who what that Mary gave

The facts in (57) show that in embedded clauses the situation is as Rudin assumes: one WH-phrase moves to spec-CP, while the others are adjoined to VP (IP in Rudin's system). Apparently, in embedded clauses there is a factor forcing a longer movement of one of the WHs, in spite of Stay. This factor is the presence of a complementizer.

The fact that the complementizer takes scope over the WHs in (57a, b) implies that if these structures are fed into the interpretational component unaltered, they will not be interpreted as questions: at LF a question interpretation is derived only if the WH operator takes scope over the entire extended verbal projection. Apparently, it is impossible to derive a question interpretation for (57a, b) through covert movement of a WH across the complementizer. This movement must rather take place overtly (cf. 57a′, b′). In WH-*in-situ* languages like Japanese, on the other hand, a question interpretation is arrived at after covert movement of one WH, as we have argued in section 3.4. The problem, then, is how this contrast arises.

To solve this problem, we must make explicit what the function of LF is. Clearly, LF prepares a given S-structure for interpretation. This means, amongst other things, that WH-operators must be part of a wellformed chain, that is, a chain in which a (possibly complex) operator in a scope position binds one or more variables (see section 3.4). Furthermore, economy considerations dictate that LF operations only apply if necessary (cf. Epstein 1992).[23] The difference between Czech and WH-*in-situ* languages can now be understood as follows.

If all WH-expressions remain *in situ* obviously no operator-variable configuration can be created. Hence, a repair procedure must take place at LF. As argued in section 3.4, one WH-expression must be raised, after which the others can be unselectively bound by it. However, in Czech all WHs are moved out of VP in overt syntax. If a WH-element has undergone overt movement, it already enters LF as part of a wellformed operator-variable chain. Consequently, economy considerations preclude further movement at LF.[24] Thus, if an embedded question is to be formed

[23] Possibly, the requirement on wellformed operator-variable configurations and the economy condition are ranked violable constraints at LF. If so, the former must universally be ranked higher than the latter (due to lack of positive evidence, language-specific rankings cannot be learned in the case of LF). We will not explore this possibility here.

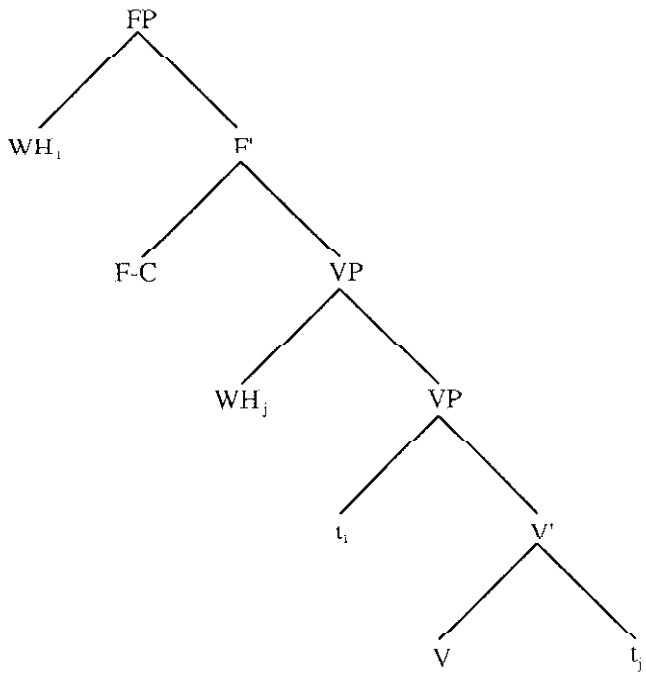
[24] As an anonymous reviewer points out, this conclusion seems to be problematic in the light of partial WH-movement constructions in German, where the embedded WH can take scope over the entire clause (cf. Müller and Sternefeld 1996):

(i) Was meinst du [wen$_i$ (dass) sie wirklich t$_i$ liebt]
what think you who that she really loves
Who do you think that she really loves?

Note, however, that the WH-expression in the matrix clause is not part of a wellformed operator-variable configuration. It does not bind a trace of its own, and it cannot unselectively bind the WH-expression in the specifier of the embedded CP. (The latter option is blocked by our earlier assumption that WH-operators in specifier positions may unselectively bind other WHs, but may not be bound by them; cf. footnote 11.) Therefore, the only way to

in Czech, at least one of the WH-expressions must move to a position c-commanding the complementizer (that is, to spec-FP) in overt syntax (cf. (58).

(58)



This is, in fact, sufficient. The interpretation as a multiple question is obtained by unselective binding of the lower WH(s) by the higher one. Stay then forbids further movement of the other WHs from their VP-adjoined position.

In (58), Stay is violated five times (the path ⟨FP, F′, VP, VP⟩ for the subject giving three violations, the path ⟨VP, VP, V′⟩ for the object giving two violations). An alternative derivation would involve formation of a

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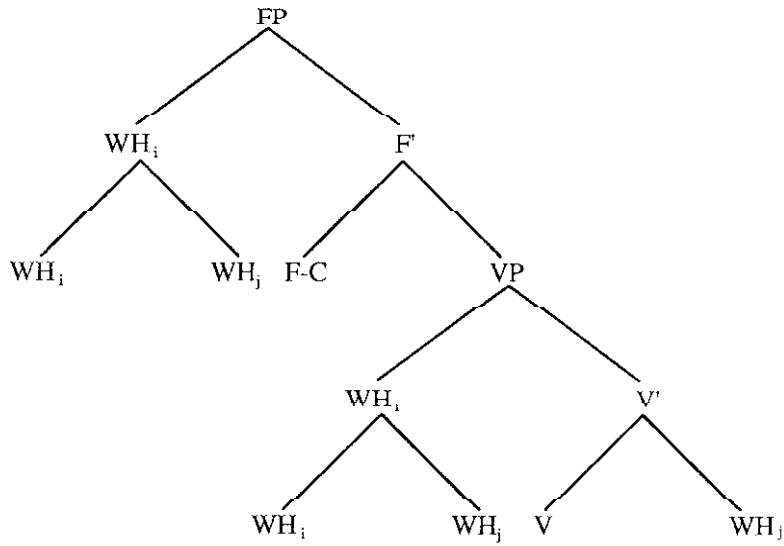
derive a wellformed operator-variable configuration in this case is by moving the lower WH-expression into the matrix domain, presumably by adjoining it to the matrix WH:

(ii) Was-wen$_i$ meinst du [t$_i$ (dass) sie wirklich t$_i$ liebt]
what-who think you that she really loves

Müller and Sternefeld (1996) note that there are languages with partial WH-movement which lack an overt WH-expression in the matrix clause (Iraqi Arabic, cf. Wahba 1991). If our account is to carry over to such cases, an empty WH-operator must be assumed to be present in the matrix clause. We do not know in how far this can be motivated independently.

WH-cluster within VP plus movement of this cluster to spec-FP, as in (59). But here Stay is violated seven times: the path ⟨VP, WH_i⟩ plus ⟨VP, V'⟩ for the object results in four violations, the path ⟨FP, F', VP⟩ for the WH-cluster results in three violations.

(59)



Note that in the optimal structure in (58), as opposed to the suboptimal one in (59), Q-marking is blocked by adjunction of a WH to VP. However, Q-Marking is ordered below Stay in Czech, and is therefore overruled.[25] Hence the contrast with Bulgarian, in which (59) is the optimal structure,

[25] It seems to be predicted that when the distance to be covered by the WH-expressions in a multiple question increases, clustering will be favored. However, the structure of multiple WH-questions in Czech remains the same when the WHs are moved out of an embedded clause to a position c-commanding the matrix-clause (insofar as this is possible in the first place, cf. Rudin 1988, p. 455). In (i), for instance, no clustering takes place:

(i) Co, podle tebe, komu Petr řekl [že Jan dal]
what, according to you, who Peter said that John gave
What, according to you, did Peter say that John gave to whom?

This problem can be solved if we follow the suggestion of Fox (1995) that evaluation of movement constraints proceeds cyclically. That is to say, Stay is first evaluated with respect to the embedded clause, then to the combination of the embedded clause and the matrix clause. In the embedded clause, Stay favors separate movement of the two WH-expressions, as explained in the main text. This means that clustering can only take place when the larger cycle is taken into account, i.e., when the two WHs have already been adjoined to the embedded VP. However, it is no longer possible then, because it would have to take place within the embedded clause (the initial landing site of the WHs), which would go against strict cyclicity.

due to the fact that Q-Marking is ranked higher than Stay (see section 3.2 for discussion).

It is predicted that, as in main clauses (cf. section 3.3), no superiority effects will obtain in Czech embedded clauses, not even with respect to the one WH that moves to spec-FP. This is because all WHs must be moved out of VP anyway. Then, for Stay it does not matter which WH-phrase is selected to move further. This prediction is correct: both (60a) and (60b) are possible (both induce five Stay violations).

(60) Chtěl bych vědět . . .
I would like to know

a. kdo (že) co četl
who that what read

b. co (že) kdo četl
what that who read

5. Further Variation

We have shown that the six possible rankings of Q-Marking, Q-Scope and Stay define four different patterns of question formation. All four patterns do actually occur. We take this to be evidence for the existence of these constraints and for their operating in an optimality-theoretic fashion. This is not to say that there is no further variation. However, this variation does not concern deviations from the basic typology derived in section 3. Rather, two patterns can occur in a single language, or multiple questions can be absent altogether. In this final section we will make some suggestions how such further variation can be accounted for.

5.1. *Irish*

Let us first consider how languages might be dealt with in which no pattern at all exists for multiple questions. Irish is of this type, as shown by McCloskey (1979, pp. 56–71). It allows simple questions like (61a), but multiple questions like (61b–b′) are ungrammatical.

(61)a. Cén rothar aL ghoud an garda
Which bicycle C stole the policeman

b. *Cé aL rinne caidé
Who C did what

b'. *Cé caidé aL rinne
Who what C did

This is unexpected, since some candidate must be optimal, and hence grammatical, no matter what. One solution for problems of this type involves a candidate we have not considered thus far, namely the so-called null parse. As Prince and Smolensky (1993, p. 176) remark, "it is clear that assigning null structure to an input is one means a grammar may use to prevent certain structures from appearing in the output. The null parse is a possible candidate which must always be considered and which may well be optimal for certain particularly problematic inputs". This idea can not only be applied to phonology but also to syntax. However, given the role interpretation plays in the definition of syntactic candidate sets, we must first consider whether the null parse will actually compete with fully realized structures.

If semantic equivalence is part of the definition of candidate set, it must be established when two candidates can be said to be semantically equivalent. In principle, GEN may realize only part of the numeration in some candidates. It is trivial that this usually gives rise to a candidate whose semantics is different from those candidates in which the entire numeration is realized. The condition of semantic equivalence thus has the consequence that, within a candidate set, underparsing is blocked.[26]

There is one exception to this, however. If nothing of the numeration is realized, the null parse results. This candidate, having no structure, is not fed into the interpretational component (or, if it is, it does not receive any interpretation). A plausible view of the condition of semantic equivalence is that it removes from the candidate set those candidates that have a deviating interpretation. As the null parse does not receive an interpretation, it will not be removed from any candidate set.

The null parse does surprisingly well on the constraints discussed above: it violates none of them. It satisfies Q-Marking since it contains no constituent that should be marked, it satisfies Q-Scope since it contains no Q-bearing element, and it satisfies Stay trivially. If nothing further would be said, we would expect the null parse to be optimal in every language. However, it violates a constraint, known as Parse, which says that elements in the numeration must be realized. Apparently, this constraint is ranked relatively high in the languages discussed so far, but it is not so in Irish (cf. Legendre et al. 1995).

Consider the constraint ranking in (62).

[26] That is, underparsing in syntax. Underparsing at PF is a different issue (cf. section 4.1).

(62) Q-Marking ≫ Parse ≫ . . .

In section 4.2 we argued that Q-Marking requires that every Q-feature in the sentence be assigned to the proposition (see (56)). Due to limitations on spec-head agreement, in practice only one WH can transfer its feature to the Q-marking head, namely the one heading the spec-FP position. This means that in a multiple question Q-Marking is always violated, except by the null parse. If the ranking is as in (62) the null parse will therefore be optimal. This explains the absence of multiple questions in Irish:

(63) *Irish Multiple Questions*

	Q-Marking	Parse
WH V [t t WH]	*!	
WH WH V [t t t]	*!	
☞ 0		*

In a simple question, Q-Marking is not violated if WH-movement to spec-FP and accompanying V-to-F movement take place: the one Q-feature that is present gets assigned to VP then. This candidate will therefore be more optimal than the null parse, since the latter violates the second constraint in (62):

(64) *Irish Simple Questions*

	Q-Marking	Parse
☞ WH V [t t]		
0		*!

The introduction of Parse has no further typological consequences but for one. Languages lacking even simple questions are expected to be possible as well, namely in case Stay and either Q-Scope or Q-Marking are ranked above Parse. All candidates for a simple question then violate one of the higher-ranked constraints, except for the null parse, which satisfies them all. We do not know whether such a language exists, but we imagine that it may not, because of functional considerations.

A further prediction can now be made. In languages that lack multiple questions but that do have simple questions, these simple questions will always satisfy Q-Marking. Consider why. Q-Marking is only violated in languages in which this constraint is outranked by Stay. If a language is

to lack multiple questions, Q-Marking must outrank Parse, as shown above. Taken together, this would result in a ranking Stay ≫ Q-Marking ≫ Parse, but as just explained, this ranking also blocks simple questions. The only possible ranking for a language like Irish therefore is Q-Marking ≫ Parse ≫ Stay, with the consequence that in simple questions Q-Marking is satisfied at the cost of Stay violations.

There is some evidence that this prediction is correct. It is supported by the fact that both Irish and Italian (which is also reported to lack multiple questions; cf. Legendre et al. 1995) do not have WH-*in-situ* in simple questions. The question then is whether WH-movement is triggered by Q-Marking (as we predict) or by Q-Scope. In Irish, at least, Q-Marking must indeed be satisfied, as is indicated by the fact that a complementizer is inserted in WH-questions (see (61a); see also section 5.2 below). In Italian Q-Marking seems to be satisfied as well, namely by verb movement to F (the verb is always adjacent to the fronted WH-word; see Rizzi 1996).[27]

5.2. *French*

In this subsection we will discuss the problem posed by languages showing more than one pattern of question formation, in other words, the problem of optionality. This problem is illustrated by the coexistence of the French constructions in (65). Root sentences either display the 'English' or the 'Chinese' pattern:

(65)a. Qu' as-tu donné à qui
what have you given to whom

b. Tu as donné quoi à qui
you have given what to whom

There are several ways in which the problem of optionality can be approached in optimality theory. One could argue that candidates are different but nonetheless score equally on all constraints. However, given the

[27] An approach which excludes multiple questions by underparsing was first proposed by Legendre et al. (1995), who argue that the optimal candidate for a multiple question in languages like Irish is derived by not parsing one (or more) WHs. This analysis differs from the one proposed here in that the optimal candidate is not the null parse, but a partially underparsed structure. Such a structure has different semantics than a fully parsed multiple question, which means that the definition of candidate sets in terms of nondistinct semantics must be abandoned. Instead, Legendre et al. propose a semantic faithfulness constraint (their Parse-WH), which has the effect that the semantics of a candidate structure must be as close as possible to the 'target' semantics.

discussion in section 3, this cannot be the case in (65). We discussed all possible rankings of the three relevant constraints and in all cases only one type of question formation turned out to be optimal.

A second possibility is that two constraints A and B are equally ranked. Under one interpretation of equal ranking, the candidate that is optimal when A outranks B and the candidate that is optimal when B outranks A are rated equally high (cf. Prince and Smolensky 1993, p. 51; Kager 1994). If these are different candidates, optionality results. The French paradigm can then be explained by the constraint ranking in (66) (where '<>' indicates equal ranking).

(66) Stay <> Q-Marking ≫ Q-Scope

As pointed out by Grimshaw and Samek-Lodovici (1995), equal ranking has a number of disadvantages. First, it has drastic typological consequences, since it is now predicted that every combination of allowed patterns may occur in a single language. Second, there is an acquisition problem. Tesar and Smolensky's (1995) learning algorithm for optimality grammars is based on total ranking of the constraints. Equal ranking is hard, if not impossible, to learn.

The last approach to optionality is to argue that in fact it does not exist. One way to achieve this result is to encode pragmatic differences of co-existing structures in the input. Each structure then is the optimal output of a different input (cf. Grimshaw and Samek-Lodovici 1995). This is implausible for the case at hand, since the two structures in (65) do not seem to have different pragmatics. Another way is to argue that the different structures belong to different varieties or registers of the language and that these varieties are characterized by distinct grammars (cf. Kroch 1989). This seems more plausible.

It is well known that colloquial French differs in many respects from the written standard (cf. Battye and Hintze 1992, p. 297). This is the case for question formation as well. As it turns out, constructions like (65a) belong to the standard language, whereas constructions like (65b) are colloquial; see Lefebvre (1982, p. 55). For our present purposes, it suffices to assume the 'English' ranking for standard French (see (16)).[28] Colloquial French requires more discussion, however.

[28] If the subject is not a clitic but a full NP like *Jean*, simple inversion as in (65a) is impossible (cf. ia). Rather, there either must be stylistic inversion as in (ib), or complex inversion (again involving a clitic) as in (ic).

(i)a. *Qui a Jean vu
who has John seen

The problem of optionality seems to reappear in colloquial French. Next to the WH-*in-situ* pattern in (65b), the pattern in (67a) is possible (see Al 1975 and Hulk 1996). In multiple questions as well, it is possible to front one WH without there being inversion. An example of this is given in (67b).

(67)a. Qui il a vu hier soir
who he has seen yesterday evening

b. A qui tu as donné quoi
to whom you have given what

Before we continue our discussion of optionality, we must consider this third pattern in more detail, because at first sight our analysis seems to exclude it altogether. The reason for this is that the WH-movement in (67a) is apparently triggered by Q-Scope, and not by Q-Marking (since there is no verb movement). However, Q-Scope would then also trigger movement of the other WH in (67b). This problem becomes more urgent in view of the fact that the pattern in (67) occurs in other languages as well. An anonymous reviewer mentions Malay/Indonesian and Iraqi Arabic.[20]

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b. Oui a vu Jean
who has seen John

c. Qui Jean a-t-il vu
who John has he seen

However, these examples do not incriminate the proposed analysis of standard French, in which both WH-movement and V-movement are obligatory. On the contrary, this assumption makes possible an explanation of the fact that stylistic inversion and complex inversion do not occur in non-WH-sentences. (ia) shows that simple inversion in French is impossible when the subject is not a clitic. What is going on in (ib) and (ic), then, is that the subject is generated in a position such that it does not block verb movement. In (ib) it is in a right-peripheral position within VP (see Sportiche 1988, Friedemann 1991, and others); in (ic) it is degraded to an adjunct (adjoined to F′, cf. Rizzi and Roberts 1989) which is linked to the subject clitic. We speculate that French subjects block simple inversion because a fronted verb binds the subject it agrees with, thus creating a chain that violates the uniformity condition on chains (cf. Chomsky 1995). This condition is not violated if the verb moves over a clitic if the clitic is a head itself. In languages with inversion, Chain Uniformity must be ranked below the constraint triggering verb movement.

[20] In general, it should be kept in mind that the distribution of WHs can be influenced by movements not restricted to these elements. Such movements are orthogonal to the issue of possible patterns of question formation. Often languages will display apparent optionality with respect to question formation when in fact one of the constructions is derived by such an independent movement. Mahajan (1990, chapter 3) argues in detail that this is the case in Hindi. A similar conclusion can be drawn for Japanese on the basis of the data in Takahashi (1993). Both languages are of the WH-*in-situ* type, but allow focus scrambling of

A closer look at these languages gives a clue as to how this pattern is to be analyzed. The problem the pattern posed was that lack of verb movement seems to indicate that WH-movement is not triggered by Q-Marking. But Q-Marking can also be satisfied if a functional head is inserted. In that case, verb movement is unnecessary and consequently suppressed by Stay. This is often the case in embedded clauses, as we have seen in section 4. However, it is not a priori impossible that a complementizer is inserted in root clauses as well.

In Malay/Indonesian, a complementizer-like element can indeed be identified in unembedded questions. This is the question particle *kah*, which immediately follows fronted WH expressions (examples from But ar-Butar 1976, pp. 211ff.; see also Cumming 1988, pp. 64–66):

(68)a. Apabila (kah) Pak Budiman berangkat
when Q mister Budiman leave
When did mister Budiman leave?

b. Bagaimana (kah) pencuri itu masuk kedalam rumah itu
how Q thief the enter into house the
How did the thief get into the house?

c. Apa (kah) pekerjaan lelaki itu
what Q job man the
What is the man's job?

As the examples show, the complementizer *kah* need not be realized. This, however, is not surprising, since deletion is common in doubly-filled-COMP contexts (see section 4.1 above). The point is that a complementizer can be inserted in the first place.

Something similar seems to be the case in Arabic. As Wahba (1984, p. 20) shows for Egyptian Arabic, the complementizer *illi* occurs in main clauses when an NP is questioned:

(69)a. Miin illi Mona darabit uh
who that Mona hit-him

b. Eeh illi Mona ?arit-uh
what that Mona read-it

WHs (and other elements). Such an analysis seems to be untenable for colloquial French and the languages mentioned by the anonymous reviewer, however.

c. Anhi walad illi Mona shafit-uh
which boy that Mona saw-him

Wahba (p. 24) observes that if a non-NP is questioned, the complementizer is not spelled out. Although we have nothing to say as to why the doubly-filled-COMP filter is sensitive to the category of the fronted element, the main point again is that Q-marking is possible without verb movement. Of course, if this strategy of Q-marking in main clauses is combined with a strict obeyance of the doubly-filled-COMP filter (as in English), a language results in which the apparently problematic pattern always occurs. If that is so, it is predicted that the pertinent language should also not have doubly-filled COMPs in embedded clauses. As far as the data in Wahba (1991) go, Iraqi Arabic may be analyzed along these lines.

With the above in mind, let us return to colloquial French. Hulk (1996) observes that in addition to the patterns in (65b) and (67), questions in colloquial French can be formed by WH-movement plus insertion of the "grammaticalized interrogative marker *est-ce que* in C" (see also Obenauer 1976):

(70) Ou est-ce que tu l'as trouvé
where ESK you it-have found

In view of the above, we may assume that colloquial French, too, has the option of satisfying Q-Marking by insertion of a functional head in main clauses, and that this functional head is not always spelled out as a result of the doubly-filled-COMP constraints (cf. Pesetsky 1995). Not spelling it out gives rise to the pattern in (67).

That this may be the correct approach is corroborated by Lefebvre (1982, p. 56), who notes that "en français populaire, on observe la présence d'un complementeur optionnel après le mot WH":

(71)a. A qui (que) Pierre parle
to whom that Pierre talks

b. Comment (que) Pierre fait
how that Pierre did

c. Qui (qui) vient
who that comes

So, this pattern as such is not problematic. What is interesting, as noted, is that optionality seems to reappear in colloquial French, since next to

the pattern just discussed, the *in situ* pattern exists. When the definition of candidate sets is taken into account again, an explanation presents itself.

We propose that the structure in (67) and the structure with all WHs *in situ* do not compete because they are projected from a different set of lexical items: one including the complementizer *esk* or *que*, the other lacking it. Suppose that there is a highly-ranked constraint in colloquial French that blocks verb movement across any subject.[30] Then the patterns of colloquial French follow from exactly the same ranking that is assumed for standard French (Q-Marking ≫ Stay ≫ Q-Scope). If no complementizer is present in the input, Q-marking is impossible, due to the ban on verb movement. The next best candidate is the one with WH-*in-situ* (which violates Stay minimally). If a complementizer is present, Q-Marking is satisfied when a WH-phrase is fronted to the specifier of the phrase headed by this complementizer. Hence, there is fronting and no inversion. At PF, the complementizer can optionally remain unpronounced.

This analysis predicts that in environments where a complementizer must be inserted, there must be WH-movement as well. This immediately explains the fact that the optionality disappears in embedded clauses in colloquial French. Here, the *in situ* pattern is impossible:

(72)a. *Je me demande que tu as vu qui
I wonder that you have seen who

b. Je me demande qui (que) tu as vu
I wonder who that you have seen

As noted by Pesetsky (1995), deletion of the complementizer in (72b) is optional, as in main questions like (70) and (71). In conclusion, the optionality in colloquial French root questions can be reduced to the optional inclusion of a complementizer in the numeration.

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[30] This may again be the uniformity condition on chains (see note 28). In that case colloquial French must differ from standard French with respect to the status of subject clitics, which must be maximal projections in colloquial French but heads in the standard language. We will have to leave this issue to future research.

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